MONITORING WELLS

INTRODUCTION

The purpose for the installation of a monitoring well is to give specific access to the ground water so that a "representative" view of the subsurface hydrogeology can be obtained, either through the collection of water samples or the measurement of physical or hydraulic parameters. The design and installation of monitoring wells at Fermi National Accelerator Laboratory (Fermilab) involves the drilling of boreholes into glacial till and sedimentary geologic formations that exhibit varying subsurface conditions. Designing and installing monitoring wells in these geologic environments may require different drilling methods and installation procedures. Each monitoring well should be designed and installed to function properly throughout the entire anticipated life of the monitoring program. In designing monitoring wells, the most reliably obtainable data should be utilized. Several components need to be considered in monitoring well design, they are: location and number of wells, drilling methods, construction details such as, well diameter, casing and screen material, screen length and depth of placement, sealing material, well development, well security and maintenance, and proper abandonment. Both the well design and the characteristics of the monitored geologic zone influence the maintenance requirements of a monitoring well. Monitoring well problems are typically caused by poor well design, improper installation, incomplete development, borehole instability, and chemical, physical, and/or biological encrustation. An aggressive well maintenance program should be conducted as an important component to any monitoring well program to ensure that the well functions properly in fulfilling the purpose for which it was installed.

Standards that apply to all monitoring wells, except those installed to monitor chemicals leaking from underground storage tanks which are installed within the excavation made for the installation of the underground storage tank, are found in 77 IAC Section 920.170. Well abandonment requirements are found in 77 IAC 920.120. This chapter describes Fermilab's program for the installation, maintenance and decommissioning of monitoring wells. Fermilab requirements for monitoring well construction including drilling methods, borehole requirements, construction techniques, well development, drilling safety, equipment cleaning and decontamination, well completion report information requirements, well abandonment and well monitoring are found in the Ground Water Protection Management Plan and Environmental Protection Procedures Manual[1]. All monitoring wells shall be under the control of the ES&H Section, except for those installed for project specific objectives by

[1] The Ground Water Protection Management Plan and the Environmental Protection Procedures Manual are documents maintained by the Environmental Protection Group of the Environment, Safety and Health Section. They are located at the Group's offices on WH7E.

other Division/sections. Such wells shall be under the control of the organization responsible for the project until the project-specific use has been accomplished.

DEFINITIONS

"Boring" means an excavation of limited diameter that is drilled, cored, driven, dug, or otherwise constructed which penetrates the saturated zone for the characterization of geologic material. Open borings may result in degraded water quality within the saturated zone by acting as a conduit for contamination.

"Ground Water" means underground water which occurs within the saturated zone and geologic materials where the fluid pressure in the pore space is equal to or greater than atmospheric pressure.

"Monitoring Well" means any well intended for the purpose of determining ground water quality or quantity.

"Saturated Zone" refers to the zone below the water table, which is the boundary where fluid pressure in the pores of a porous medium is exactly 1 atmosphere. The location of this surface is revealed by the level at which water stands in a shallow monitoring well open along its length and penetrating the surface deposits just deeply enough to encounter standing water in the bottom.

SPECIAL RESPONSIBILITIES

The ES&H Section shall:

1. Determine if monitoring wells meet the requirements of this chapter and, if not, request modification or abandonment.

2. Provide consultation for, and review all proposed projects requiring soil boring to characterize the geologic materials within the saturated zone or the installation of a monitoring well.

3. Conduct inspections of any monitoring wells installed by other Division/sections during and after construction.

4. Maintain a centralized database of monitoring wells.

5. Maintain a monitoring well maintenance program.

6. Be responsible for all monitoring wells incorporated into the sitewide monitoring well network.

7. Coordinate the required notification to the County Department of Public Health for any monitoring well abandonment.

8. Provide the appropriate Division/section with a report of any inspection of a monitoring well that requires action.

The Division/sections shall:

1. Notify the ES&H Section Head prior to the installation of any monitoring well. Within 60 days of the adoption of this chapter, supply the ES&H Section Head with the location of all monitoring wells within their jurisdictions.

2. Coordinate all projects requiring the drilling of a soil boring or installation of a monitoring well that extends into the saturated zone with the ES&H Section Head.

3. Supply the ES&H Section with a copy of the Drill Log and Well Completion Report of any monitoring well.

4. Supply the ES&H Section with a copy of any key used to secure the above ground protective casing of a monitoring well.

5. Notify the ES&H Section Head prior to abandoning any monitoring well.

6. Supply the ES&H Section with any information requested by the ES&H Section to fulfill inspection or maintenance requirements.

EXCEPTIONS

Soil borings are not included in the requirements of this chapter unless specifically mentioned. However, borings must be closed immediately after drilling, before the drill rig is pulled off of the hole. Borings extending beyond 50% of the distance to bedrock shall be properly grouted. Soil borings are for the characterization of subsurface materials only and shall not be used to fulfill the purposes of a monitoring well.

PROCEDURES

All new monitoring wells constructed at Fermilab shall comply with the requirements of this chapter. Monitoring wells currently maintained and monitored will be modified, if possible, to meet applicable requirements. If a currently managed monitoring well is determined by the ES&H Section Head to be unable to meet these requirements, it will be abandoned within 30 days.

Managers of projects that require the installation of monitoring wells shall consult with the ES&H Section prior to installation of the wells. This consultation will be initiated by an environmental review of any proposed subsurface exploration by the ES&H Section Head. The proposed project will be evaluated and authorization to proceed with the well installation and/or comments on the project will be forwarded back to the project manager. The ES&H Section Head shall then be notified prior to the construction of any new monitoring well. After completion of construction, the responsible Division/section will supply the ES&H Section with a copy of the Drill Log and Well Completion Report, along with any pertinent project plan/design information, so that it can be included in the centralized Monitoring Well Database and the Well Maintenance Program. A copy of the key used to secure the above ground protective casing of any monitoring well shall be supplied to the ES&H Section during the project so that the monitoring well can be inspected. Any monitoring well determined to be useful after project completion will be incorporated into the sitewide monitoring well network and will be transferred to the ES&H Section. Any monitoring well included in the sitewide network will become the sole responsibility of the ES&H Section and will be secured by an ES&H Section lock. Otherwise, the monitoring well will be abandoned according to regulations.

An inspection of all monitoring wells constructed by other Division/sections shall be conducted, after completion as well as periodically during the project period, by the ES&H Section. The Division/section shall supply all records requested by the ES&H Section Head necessary to meet the inspection requirements. Pertinent performance information includes: well depth measurements, well development information, piezometric measurements, etc. A report of review findings requiring action will be forwarded to the Division/section from the ES&H Section Head.

All monitoring wells shall be included in the ES&H Section's Well Maintenance Program. The program will consist of periodic (annually at minimum) checking of performance and construction records as well as making sure the well is clearly visible, the well is accessible, the security system is operating adequately, well identification markers are adequate, checking for loss of integrity of the surface seal, and confirming that the well efficiency or performance has not changed significantly.

REFERENCES

1. Title 77: Public Health, Chapter I: Department of Public Health, Subchapter r: Water and Sewage, Part 920: Illinois Water Well Construction Code. 1994.

2. Ordinance Number 91-101. State of Illinois, County of Kane, Water Supplies/Wells. 1991.

3. Ordinance Number OH-0002-90, Chapter 34, DuPage County Code. DuPage County Health Department Private Water Supply Ordinance. December 1990.